IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A multicarrier transmitter comprising:

a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

a space-frequency symbol mapper to map precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

wherein the multicarrier carrier transmitter is configured to be coupled with a plurality of transmit antennas, each transmit antenna corresponding to one of the spatial channels.

2. (Original) The transmitter of claim 1 further comprising:

a symbol mapper to generate a serial symbol stream from an input serial bit stream; and

a serial-to-parallel converter to generate the plurality of parallel symbol vectors from the serial symbol stream, each of the symbol vectors having more than one symbol.

3. (Original) The transmitter of claim 2 further comprising inverse fast Fourier transform (IFFT) circuitry to generate signals for radio-frequency (RF) transmission on a corresponding one of the spatial channels from space-frequency mapped symbols provided by space-frequency symbol mapper.

4. (Original) The transmitter of claim 1 wherein the precoder is a linear-square precoder to separately precode each of the plurality of parallel symbol vectors to generate a plurality of parallel precoded symbol vectors.

5. (Currently Amended) A multicarrier transmitter comprising:

a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

a space-frequency symbol mapper to map precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

wherein the precoder is a linear-square precoder to separately precode each of the plurality of parallel symbol vectors to generate a plurality of parallel precoded symbol vectors, and

~~The transmitter of claim 4~~ wherein the complex field matrix is a square complex field matrix having substantially a row-wise Vandermonde structure.

6. (Cancelled)

7. (Currently Amended) The transmitter of claim 1 [[6]] wherein the precoder encodes an MxG number of parallel symbol vectors, each parallel symbol vector having MxK symbols,

wherein the partitioner groups the precoded symbol vectors into G groups of the parallel symbol vectors, each group having M of the precoded symbol vectors,

wherein M, G and K are positive integers,

wherein MxKxG is equal to a number of data subcarriers of the multicarrier communication channel, and

wherein M corresponds to a number of the transmit antennas.

8. (Original) The transmitter of claim 7 wherein symbols of the precoded symbol vectors are associated with a layer of symbols, wherein a number of layers is M for each group,

wherein the space-frequency symbol mapper maps each precoded symbol of the precoded symbol vectors to one of the subcarriers and to one of the transmit antennas based on the group and the layer associated with the symbol, and

wherein the space-frequency symbol mapper maps MxKxG symbols to each transmit antenna and provides the mapped symbols in multiples of the MxKxG symbols to IFFT circuitry associated with the transmit antennas for modulation on the subcarriers.

9. (Original) The transmitter of claim 7 wherein the space-frequency symbol mapper maps at least some symbols of the layers to the subcarriers and the transmit antennas in a sequential manner based on the symbols group and position within the group.

10. (Currently Amended) <u>A multicarrier transmitter comprising:</u>

<u>a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;</u>

<u>a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and</u>

<u>a space-frequency symbol mapper to map precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,</u>

~~The transmitter of claim 1~~ wherein the multicarrier communication channel comprises the plurality of spatial channels, each spatial channel associated with one of the plurality of transmit antennas,

wherein each spatial channel employs the same frequency subcarriers as the other spatial channels,

wherein the transmit antennas have a spacing therebetween of at least approximately a half-wavelength of a transmit frequency.

11. (Currently Amended) <u>A multicarrier transmitter comprising:</u>

a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

a space-frequency symbol mapper to map precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

~~The transmitter of claim 1~~ wherein the multicarrier communication channel comprises a plurality of symbol-modulated subcarriers, and

wherein each symbol-modulated subcarrier has a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers of the multicarrier communication channel.

12. (Currently Amended) A multicarrier transmitter comprising:

a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

a space-frequency symbol mapper to map precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

~~The transmitter of claim 1~~ wherein the transmitter is part of a multicarrier communication station comprising the multicarrier transmitter and a multicarrier receiver, wherein the multicarrier receiver comprises:

a demultiplexer to generate groups of symbol vectors by combining corresponding subcarrier frequency components of received symbol vectors;

a null canceller associated with each group of symbol vectors to perform null canceling on a per-subcarrier basis for symbol vectors of the associated group based on a decoded symbol vector, the null canceller to generate null-cancelled symbol vectors;

a decoder associated with each group to decode layers of symbols of the associated group and multiply an output of the decoder one layer at a time by a complex-field matrix to regenerate symbol vectors for the null canceller.

13. (Original) A multicarrier receiver comprising:

a demultiplexer to generate groups of symbol vectors by combining corresponding subcarrier frequency components of received symbol vectors;

a null canceller associated with each group of symbol vectors to perform null canceling on a per-subcarrier basis for symbol vectors of the associated group based on a decoded symbol vector, the null canceller to generate null-cancelled symbol vectors;

a decoder associated with each group to decode layers of symbols of the associated group and multiply an output of the decoder one layer at a time by a complex-field matrix to regenerate symbol vectors for the null canceller.

14. (Original) The receiver of claim 13 wherein the null canceller iteratively cancels interference from the symbol vectors in successive layers.

15. (Original) The receiver of claim 13 wherein each group of symbol vectors generated by the demultiplexer comprises symbol components combined from different subcarriers, and

wherein the decoder is a sphere decoder and generates decoded quadrature amplitude modulated symbol vectors for each subcarrier of the multicarrier communication channel.

16. (Original) The receiver of claim 13 further comprising:

FFT circuitry to demodulate received subcarriers of the multicarrier communication signal received over a plurality of receive antennas to generate the received symbol vectors associated with each receive antenna, the received symbol vectors comprising symbol components from a plurality of subcarriers of the multicarrier communication channel;

a demapper to demap the decoded symbol vectors for each group to generate a plurality of parallel sets of bits; and

a parallel to serial converter to generate a serial bit stream from the plurality of parallel sets of bits.

17. (Original) The receiver of claim 13 wherein the receiver is part of a multicarrier communication station comprising the multicarrier receiver and a multicarrier transmitter, wherein the multicarrier transmitter comprises:

a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

a space-frequency symbol mapper to map precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group.

18. (Currently Amended) A communication station comprising:

a plurality of antennas; [[and]]

a multicarrier transmitter to encode symbols with space-frequency block codes for transmission over a multicarrier communication channel; and

a multicarrier receiver, to decode signals received over the multicarrier communication channel encoded with the space-frequency block codes using an iterative nulling process to successively cancel interference from layers of symbols,

wherein the space-frequency block codes comprise precoded symbols mapped to the plurality of transmit antennas and to subcarriers of the multicarrier communication channel.

19. (Original) The communication station of claim 18 wherein the multicarrier transmitter comprises:

a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

a space-frequency symbol mapper to map the precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of the multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group.

20. (Cancelled)

21. (Currently Amended) The communication station of claim <u>18</u> [[20]] wherein the multicarrier receiver comprises:

a demultiplexer to generate groups of symbol vectors by combining corresponding subcarrier frequency components of received symbol vectors;

a null canceller associated with each group of symbol vectors to perform null canceling on a per-subcarrier basis for symbol vectors of the associated group based on a decoded symbol vector, the null canceller to generate null-cancelled symbol vectors;

a decoder associated with each group to decode layers of symbols of the associated group and multiply an output of the decoder one layer at a time by a complex-field matrix to regenerate symbol vectors for the null canceller.

22. (Currently Amended) A method of transmitting over a multicarrier communication channel comprising:

encoding a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

grouping the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

mapping precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels

at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

wherein the mapping comprises mapping the precoded symbols of the precoded symbol vectors to one of the subcarriers of the multicarrier communication channel and to one of a plurality of transmit antennas, wherein each transmit antenna corresponds to one of the spatial channels.

23. (Original) The method of claim 22 further comprising:

generating a serial symbol stream from an input serial bit stream; and

generating the plurality of parallel symbol vectors from the serial symbol stream, each of the symbol vectors having more than one symbol.

24. (Original) The method of claim 23 further comprising performing inverse fast Fourier transform (IFFT) to generate signals for radio-frequency (RF) transmission on a corresponding one of the spatial channels from space-frequency mapped symbols generated by the mapping of the precoded symbols.

25. (Original) The method of claim 22 wherein encoding comprises encoding the symbol vectors with a linear-square precoder to separately precode each of the plurality of parallel symbol vectors to generate a plurality of parallel precoded symbol vectors.

26. (Currently Amended) A method of transmitting over a multicarrier communication channel comprising:

encoding a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

grouping the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

mapping precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels

<u>at least in part based on the precoded symbol's group and the precoded symbol's position within the group,</u>

<u>wherein encoding comprises encoding the symbol vectors with a linear-square precoder to separately precode each of the plurality of parallel symbol vectors to generate a plurality of parallel precoded symbol vectors, and</u>

~~The method of claim 25~~ wherein the complex field matrix is a square complex field matrix having substantially a row-wise Vandermonde structure.

27. (Cancelled)

28. (Currently Amended) The method of claim <u>22</u> [[27]] wherein the encoding comprises encoding an MxG number of parallel symbol vectors, each parallel symbol vector having MxK symbols,

wherein the grouping comprises grouping the precoded symbol vectors into G groups of the parallel symbol vectors, each group having M of the precoded symbol vectors,

wherein M, G and K are positive integers,

wherein MxKxG is equal to a number of data subcarriers of the multicarrier communication channel, and

wherein M corresponds to a number of the transmit antennas.

29. (Original) The method of claim 28 wherein symbols of the precoded symbol vectors are associated with a layer of symbols, wherein a number of layers is M for each group,

wherein the mapping further comprises mapping each precoded symbol of the precoded symbol vectors to one of the subcarriers and to one of the transmit antennas based on the group and the layer associated with the symbol, and

wherein the mapping further comprises mapping MxKxG symbols to each transmit antenna and to provide the mapped symbols in multiples of the MxKxG symbols for modulation on the subcarriers.

30. (Original) The method of claim 28 wherein the mapping comprises mapping at least some symbols of the layers to the subcarriers and the transmit antennas in a sequential manner based on the symbols group and position within the group.

31. (Currently Amended) A method of transmitting over a multicarrier communication channel comprising:

encoding a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

grouping the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

mapping precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

~~The method of claim 22~~ wherein the multicarrier communication channel comprises the plurality of spatial channels, each spatial channel associated with one of the plurality of transmit antennas,

wherein each spatial channel employs the same frequency subcarriers as the other spatial channels,

wherein the transmit antennas have a spacing therebetween of at least approximately a half-wavelength of a transmit frequency.

32. (Currently Amended) A method of transmitting over a multicarrier communication channel comprising:

encoding a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

grouping the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

mapping precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels

<u>at least in part based on the precoded symbol's group and the precoded symbol's position within the group,</u>

~~The method of claim 22~~ wherein the multicarrier communication channel comprises a plurality of symbol-modulated subcarriers, and

wherein each symbol-modulated subcarrier has a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers of the multicarrier communication channel.

33. (Original) A method of receiving over a multicarrier communication channel comprising:

generating groups of symbol vectors by combining corresponding subcarrier frequency components of received symbol vectors;

performing null canceling on a per-subcarrier basis for symbol vectors of an associated group based on a decoded symbol vector to generate null-cancelled symbol vectors; and

decoding layers of symbols of the associated group by multiplying a decoded output one layer at a time by a complex-field matrix to regenerate symbol vectors for performing the null canceling.

34. (Currently Amended) The method of claim 33 wherein performing null canceling comprises iteratively ~~cancelling~~ <u>canceling</u> interference from the symbol vectors in successive layers.

35. (Original) The method of claim 33 wherein each group of symbol vectors comprises symbol components combined from different subcarriers, and

wherein decoding comprises spherically decoding to generate decoded quadrature amplitude modulated symbol vectors for each subcarrier of the multicarrier communication channel.

36. (Original) The method of claim 35 further comprising:

demodulating received subcarriers of the multicarrier communication signal received over a plurality of receive antennas to generate the received symbol vectors associated with each receive antenna, the received symbol vectors comprising symbol components from a plurality of subcarriers of the multicarrier communication channel;

demapping the decoded symbol vectors for each group to generate a plurality of parallel sets of bits; and

generating a serial bit stream from the plurality of parallel sets of bits.

37. (Currently Amended) A system comprising:

~~one or more~~ a plurality of substantially omnidirectional transmit antennas;

a multicarrier transmitter coupled to the transmit antennas, the multicarrier transmitter comprising:

a precoder to encode a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

a partitioner to group the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

a space-frequency symbol mapper to map precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

wherein each transmit antenna corresponds to one of the spatial channels.

38. (Original) The system of claim 37 wherein the transmitter further comprises:

a symbol mapper to generate a serial symbol stream from an input serial bit stream; and

a serial-to-parallel converter to generate the plurality of parallel symbol vectors from the serial symbol stream, each of the symbol vectors having more than one symbol.

39. (Original) The system of claim 38 wherein the transmitter further comprises inverse fast Fourier transform (IFFT) circuitry to generate signals for radio-frequency (RF) transmission

on a corresponding one of the spatial channels from space-frequency mapped symbols provided by space-frequency symbol mapper.

40. (Currently Amended) A computer-readable medium that stores instructions for execution by one or more processors ~~machine-readable medium that provides instructions,~~ which ~~when executed by one or more processors,~~ cause the processors to perform operations comprising:

encoding a plurality of symbol vectors by multiplying each of the symbol vectors by a complex field matrix to generate precoded symbol vectors;

grouping the precoded symbol vectors into a plurality of groups, each group having more than one of the precoded symbol vectors; and

mapping precoded symbols of the precoded symbol vectors to one of a plurality of subcarriers of a multicarrier communication channel and to one of a plurality of spatial channels at least in part based on the precoded symbol's group and the precoded symbol's position within the group,

wherein the mapping comprises mapping the precoded symbols of the precoded symbol vectors to one of the subcarriers of the multicarrier communication channel and to one of a plurality of transmit antennas, wherein each transmit antenna corresponds to one of the spatial channels.

41. (Currently Amended) The computer-readable ~~machine-readable~~ medium of claim 40 wherein the instructions, when further executed by one or more of the processors cause the processors to perform operations further comprising:

generating a serial symbol stream from an input serial bit stream; and

generating the plurality of parallel symbol vectors from the serial symbol stream, each of the symbol vectors having more than one symbol.

42. (Currently Amended) The computer-readable ~~machine-readable~~ medium of claim 41 wherein the instructions, when further executed by one or more of the processors cause the processors to perform operations further comprising performing inverse fast Fourier transform

(IFFT) to generate signals for radio-frequency (RF) transmission on a corresponding one of the spatial channels from space-frequency mapped symbols generated by the mapping of the precoded symbols.